SOUTH DAKOTA MATH CONTENT STANDARDS

May 2004

Table of Contents

Acknowledgements

The revised mathematics standards are a result of the contributions of many educators from across the state. Many hours were devoted to research and thoughtful consideration of issues to ensure the standards would reflect rigorous mathematics teaching and opportunities for students to learn important mathematical concepts and procedures with understanding. The mathematics standards revision committee members represent the many concerned individuals across the state dedicated to their profession and to high quality mathematics education for all South Dakota students. Without their contributions the revision of the mathematics content standards would not have been possible. The South Dakota Department of Education wishes to express appreciation and gratitude to the individuals and the organizations they represent who contributed expertise and time to the revision of South Dakota's Mathematics Content Standards.

South Dakota Mathematics Revision Committee Members

(For more information about this distinguished panel, see Appendix A.)

Roxie Ahlbrecht, 2nd Grade Classroom Teacher, Sioux Falls Public School District 49-5

Jay Berglund, Secondary Mathematics Teacher, Gettysburg School District

Steve Caron, Secondary Mathematics Teacher, Aberdeen Public School 6-1

Mary Jo Christensen, 2nd Grade Teacher, Webster School District

Ellie Cooch, 8th Grade Mathematics Teacher, Spearfish School District

James Cutshaw, 7th Grade and Sheltered Mathematics Teacher, Sioux Falls Public

Marinela Cyriacks, English Language Learner Instructor, Huron School District 02-2

Carol DeVries, 4th Grade Teacher, Bennett County School District

Dr. Ralph Erion, Professor of Educational Leadership, South Dakota State University

Kathleen Famestad, 3rd Grade Teacher, Sioux Falls Public School District 49-5

Debra Ford, 4th Grade Teacher, Chamberlain School District

Jean Gomer, 7-12 Mathematics Teacher, Deubrook Area Schools

Doug Heller, 7-8 Mathematics and Reading Teacher, Huron Public Schools

Kelly Hinds, 4th Grade Teacher, Aberdeen Public Schools

Allen Hogie, Secondary Mathematics Instructor, Brandon Valley School District

Charles Holmstrom, High School Mathematics Instructor, Sioux Falls Public School

Vicki Kapust, Associate Director, Center for the Advancement of Mathematics and Science Education, Black Hills State University

Leo Keiser, High School Mathematics Instructor, Beresford Schools

Susan Kessel, 8th Grade Mathematics Teacher, Meade County School District 46-1

Cynthia Kroon, High School Mathematics Instructor, Montrose School District 43-2

Brady Lunde, Middle School Mathematics Teacher, Watertown School District

Jan Martin, Coordinator of Assessment and Evaluation, Todd County School District

Diana McCann, Middle School / High School Mathematics, Bon Homme School District 4-2

Patricia Moore, 6th Grade Mathematics Teacher, Brookings School District

Dr. Curtis Olson, Chairperson and Associate Professor of Mathematical Sciences, University of South Dakota

Michele Perrizo, 4th Grade Teacher, Aberdeen Public Schools

Patricia Reiners, 7th Grade Mathematics Instructor, West Central School District

Marie Ritten, Secondary Mathematics Coordinator, Rapid City Area Schools

Kimberly Schara, 6th Grade Mathematics, Science and Reading Teacher, Rapid City Area Schools

Robert Schuh, High School Mathematics Teacher, McIntosh School District 15-1

James Stearns, 8-12 Math, Science and Computer Teacher, Bristol School District 18-1

Doris Stiles, 4th Grade Teacher, Pierre Public Schools

Anne Thompson, Secondary Mathematics Instructor, Sioux Falls Public School District 49-5

Sandy Ullrich, 2nd Grade Teacher, Aberdeen Public Schools

Rebecca Umenthum, 6th Grade Mathematics Teacher, Belle Fourche School District

Gloria Vavra, 4-8 Teacher, Spring Valley Colony, Wessington Springs School District

Nancy Ward, Elementary Mathematics Coordinator, Rapid City Area Schools

Dr. Don Wiken, Associate Professor, College of Education, Dakota State University

The South Dakota Department of Education gratefully acknowledges the educational leadership of consultants Dr. Jan Sheinker and Dr. Carol Ann Watson for their vision and guidance in the development of this document.

The South Dakota Department of Education extends sincere appreciation to the Office of Curriculum, Technology and Assessment staff who carried the primary responsibility for overseeing the revision and editing the SD Mathematics Content Standards. Shannon Amiotte under the direction of Dr. Tammy Bauck provided primary leadership to this committee.

The South Dakota Department of Education expresses special thanks to all of the individual teachers, administrators, mathematicians and mathematics education faculty, community members and business leaders, grandparents, parents and students who took the time to provide thoughtful comments during the public comment period.

INTRODUCTION

PREFACE

These Mathematics Standards are set forth to ensure graduates of South Dakota's public schools have the knowledge, skills, and competencies essential to leading productive, fulfilling, and successful lives as they continue their education, enter the workforce, and assume their civic responsibilities.

In 1997, the South Dakota State Legislature passed SB170 that amended South Dakota Codified Law 13-3-48 to address the issue of challenging state content standards. The adopted amendment reads as follows: "The Secretary of the Department of Education and Cultural Affairs [now the Department of Education] shall prepare and submit for approval of the South Dakota Board of Education academic content standards in language arts, mathematics, social studies, and science for grades one through twelve. Each school district shall adopt and implement clearly defined and measurable course guidelines so as to meet the state academic content standards."

With input from students, parents, teachers, and communities of South Dakota, the Standards Committee was charged with revision of the current South Dakota Content Standards and Performance Descriptors. The final document evolved from recent research in best practices in teaching, the **No Child Left Behind** legislation, experience in classrooms with the existing South Dakota Content Standards, the evolution of published standards from other states, the National Council of Teachers of Mathematics (NCTM) Standards, and National Assessment of Educational Progress (NAEP) Frameworks and descriptors, numerous professional publications, and lengthy discussions by experienced kindergarten through grade sixteen, South Dakota educators.

The content students need to acquire at each grade level is stated explicitly in these standards. With student mastery of this content, South Dakota schools will be competitive with the best educational systems in other states and nations. The standards are comprehensive and specific, they are rigorous, and they represent South Dakota's commitment to excellence. The standards are firm but not unyielding; they will be modified in future years to reflect new research and scholarship.

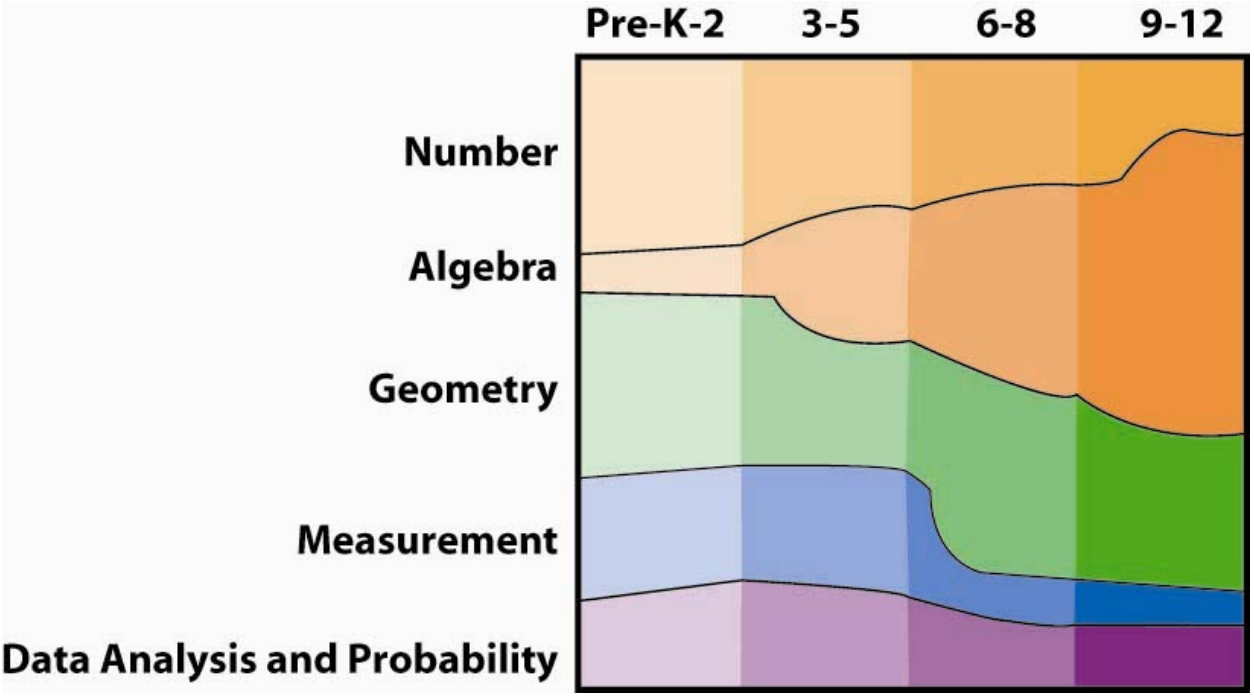
THE PURPOSE OF THE SOUTH DAKOTA STANDARDS DOCUMENT

The South Dakota standards provide a listing of essential core content to be taught and learned. The standards are designed to guide the planning of instruction and to anchor the assessment of learning from kindergarten through twelfth grade. Performance descriptors bridge the content standards to assessments of the standards, provide information to teachers and students regarding student progress toward mastery of the standards, and give them specific targets for instruction and learning. The document presents a starting point for informed dialogue among those dedicated and committed to quality education in

South Dakota. By providing a common set of goals and expectations for all students in all schools, this dialogue will be strengthened and enhanced.

KEY CONSIDERATIONS FOR STANDARDS DEVELOPMENT

As students move from kindergarten through grade 12, levels of cognitive demand and complexity of content, skills, and processes increase. New skills emerge and basic skills are subsumed within more advanced skills as students progress through the grades. The NCTM *Principles and Standards for School Mathematics* (2002) illustration below graphically demonstrates this process of emerging and subsuming skills in the following way.



Furthermore, based on information available through national standards work and developmental research, consideration has been given in these standards to the developmental appropriateness of skills required at each grade level. In consideration of developmental appropriateness, the committee has provided emphasis in each grade span as follows.

- Kindergarten through grade 2 standards emphasize numbers and their relationships, operations, place value, and attributes of shapes.

- Grades 3 through 5 standards emphasize multiplicative reasoning, equivalence, and computational fluency with whole numbers.
- Grades 6 through 8 standards emphasize linear equations in algebra, linear relationships and similarities in geometry, proportionality, and connections between algebra and geometry.
- Grades 9 through 12 standards emphasize new classes of functions, new geometric perspectives, new ways of analyzing data, and justifying mathematical reasoning.

Grade-level standards specify what students should know and be able to do by the end of each grade level, while curriculum specifies what teachers will teach. Because standards are not curriculum, the review embedded in curriculum does not appear from grade to grade across grade-level standards. Teachers are charged with introducing skills in earlier grades before mastery is expected and with reviewing skills students will need to use in mastering the grade-level standards. Teachers and researchers have learned that in order for students to demonstrate mastery of skills specified in the standards on summative (end-of-year) assessments, **teachers must teach and students must learn at a level of fluency that exceeds the apparent expectations of the grade-level standard.** For this reason, teachers must be aware of and skilled in teaching the content, skills, and processes described in standards immediately below and above as well as at their own grade-level assignment.

FORMAT OF THE STANDARDS DOCUMENT

Standards

The standards are the targets all students need to meet at the proficient level by the end of each grade level. The standards are presented in two formats. The first format organizes the standards by grade level so a student, parent, classroom teacher, administrator, or local school board member can quickly review what learning is expected at each specific grade. The Bloom's Taxonomy level of cognitive challenge is listed in the standards document to make clear the level at which each standard should be assessed.

At grades 9 through 12, schools teach skills and courses in a variety of configurations to accommodate students and school personnel, especially in rural settings. For this reason, the grade-level standards are grouped into core and advanced standards. The core high school standards all students are expected to meet by graduation include topics of first year algebra and geometry. The advanced high school standards apply to students who have completed the core standards and choose an advanced mathematics curriculum. Students who plan to attend post-secondary educational institutions should complete mathematics courses reflected in the advanced standards. Taking rigorous mathematics courses will be important to success in post-secondary educational studies.

All standards in each grade level and the core standards for high school need to be met at the proficient level by the time students are tested for these skills on the state assessments. For early grades not assessed on the state assessments, students need to master the standards at each grade level in order to be adequately prepared to meet the

next grade-level standards and subsequently, to achieve the proficient level at the grade levels tested.

The standards are also provided in a side-by-side format so the alignment of standards from grade to grade is immediately apparent. This section of the document contains content goals, indicators, grade-level standards, and performance descriptors. Each has a role in shaping the expected outcomes for South Dakota students.

- **Goals and indicators** are the common threads that represent expected outcomes for all students preparing to graduate from South Dakota schools.
- **Grade-level content standards** represent expected outcomes for students completing each grade level.
- **Grade-level supporting skills** represent enabling skills students may need to be taught in order to achieve the standards. Those identified by a (•) bullet are enablers to the specific grade-level standard. Those identified by a checkmark (√) are enablers to the next higher grade-level standards that are related to current grade-level standards and thus may be introduced at an earlier time.
- **Examples** represent some possible materials, activities, or sub-skills classroom instructors could use in teaching the standards or supporting skills. Examples are not provided where the meaning of the standard should be evident to the reader. While the intention of providing examples is to clarify what is intended in terms of the complexity and level of challenge of the standard, these examples do not represent actual test items that will appear on the assessment.

Performance Descriptors

The performance descriptors are organized into proficiency levels. These proficiency levels describe how a student at that level would be expected to perform the grade-level standards. To identify increasing proficiency in mathematics, the levels are labeled as follows:

- **Advanced:** A student performing at the advanced level exceeds expectations for that grade level. The student is able to perform the content standards for the grade at a high level of difficulty, complexity, or fluency beyond that specified by the grade-level standards.
- **Proficient:** A student performing at the proficient level meets expectations for that grade level. The student is able to perform the content standards for the grade at the level of difficulty, complexity, or fluency specified by the grade-level standards.
- **Basic:** A student performing at the basic level performs below expectations for that grade level. The student is able to perform some of the content standards for the grade below the level of difficulty, complexity, or fluency specified by the grade-level standards.

A student performing below the basic level is unable to perform the content standards for the grade. Therefore, no description is provided below the basic level.

ADDITIONAL RESOURCES

Since this document uses appropriate mathematics terminology, a reader may occasionally encounter an unfamiliar term. In order to assist the reader with terminology used in this document, a **glossary** has been written with specific definitions to clarify intended meaning.

A **resource list** is provided in the appendix as a sampling of possible information sources. Because new resources are constantly becoming available, this list is intended to be neither an exhaustive nor a required list of resources.

A MESSAGE TO TEACHERS, PRINCIPALS, SUPERINTENDENTS AND OTHERS WHO WILL USE THE DOCUMENT

The Standards Committee was made up of a group of K-16 teachers who pooled their thoughts and experiences to provide a starting place for reaching South Dakota's goal: each student performing to at least the proficient level.

A set of standards is simply a place to begin—it lays the foundation for measurable, consistent, high-level student learning; however, teachers must consider the needs of their individual students and select the methods that will work best for their classrooms. Examples and lists of supporting skills have been provided to clarify but not limit the meaning of the standards. ***The curriculum of each district must provide students with rigor and topics beyond those of the standards in order to ensure mastery.***

Clearly, there is more to teaching and learning than these standards. Adjustments will need to be made for those students who exceed the standards and for those who cannot easily meet them. The standards are a starting point in creating an environment where students can learn to live and thrive in a constantly changing, increasingly complex world.

IMPORTANT NOTE TO TEACHERS: Not every supporting skill presented in this document needs to be taught in order for students to master that standard. This is also true for the examples that appear in this document. Supporting skills and examples are provided only to illustrate the standard, and are not designed as requirements to be taught.

CONCLUSION

South Dakota's students must grow progressively in their mastery of mathematical concepts and applications. They will need a wide repertoire of mathematics skills to succeed as learners, workers, and citizens in the 21st century. The ultimate purpose of the Mathematics Content Standards is to ensure that all students are offered the opportunities,

the encouragement, and the vision to develop the mathematics skills they need to pursue lifelong goals, including participating as fully functioning members of society.